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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/760,087	01/14/2004	Arup Bhattacharyya	MI22-2473	2443

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EXAMINER

MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
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3663

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/760,087

Applicant(s)

BHATTACHARYYA, ARUP

Examiner

Johannes P. Mondt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 71-73, 76 and 78-81 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 71-73, 76 and 78-81 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response filed 12/27/06 forms the basis for this action. Comments on Remarks are included below under "Response to Arguments."

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. **Claim 71** is rejected under 35 U.S.C. 103(a) as being unpatentable over Walker et al (6,888,750 B2) in view of Yamazaki et al (6,693,044 B1) and Yamazaki et al (6,759,677 B1), henceforth referred to as "Yamazaki-1" and "Yamazaki-2", respectively.

Walker et al teach a computer system (col. 1) (e.g., logic circuits (Figures 12-14) together with the nonvolatile memory array (see "Field of Invention") constitute a computer system) with stacking according to the embodiment of Figures 10) comprising: a signal source capable to provide a data signal (from word line 445; col. 17, lines 60-65); and an inverter 443 coupled with the signal source (col. 17, l. 45-46), capable to invert the data signal and output the inverted signal (through bit lines 447); the inverter including (Figure 10):

a structure 333/343 comprising semiconductor material (Figure 10A; see col. 12, l. 56 – col. 13, l. 64) comprising silicon and germanium (col. 3, l. 28-41);

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a first transistor (PMOS TFT with gate 339; Figure 10A, and col. 13, l. 53-59) supported by the structure, the first transistor comprising a first gate 339 (Figure 10A and col. 13, l. 53-59) and first active region (337/343: Figure 10A and col. 13, l. 5-18) proximate the first gate; the first active region including a first channel region (337 = region between neighboring s/d regions 343) and a pair of first source/drain regions 343 (col. 13, l. 13-18); at least a portion of the first active region being within the structure (Figure 10A;), the first transistor being a PFET and the first source/drain regions accordingly being p-doped regions (Fig.10A and col. 13, l. 12-18);

an insulative material 359 (col. 14, l. 8-12) over at least a portion of the first transistor (Fig.10A);

a second transistor over the material layer and comprising a second gate (col. 14, l. 47-57) the second transistor being an NFET (NMOS TFT)) (Figure 10A) and the second source/drain regions accordingly being n-type doped regions (loc.cit.); the first and second gates being electrically connected to one another (col. 14, l. 47-57), and being in electrical connection with the signal source 471(Figure 14); and one of the first source/drain regions being electrically connected to one of the second source/drain regions and being in electrical connection with the output (Figure 14).

Walker et al do not necessarily teach the limitation “a first layer of semiconductive material over the insulative material; a second layer of semiconductive material over the first layer, the second layer of semiconductive material physically contacting the first layer of semiconductive material, and the

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second layer of semiconductive material being compositionally different from the first layer of semiconductive material", i.e., lines 13-17 of claim 71.

*However, it would have been obvious to include said further limitation in view of Yamazaki-1, who, in a patent on TFTs (thin film transistors) (cols. 1-2), hence analogous art (see Walker et al, cols. 12-14), teach in their Embodiment 2 (cols. 8-10) the TFT to be supported by a first layer of semiconductive material 202 (see Figures 2, col. 8, l. 39-49 and col. 9, l. 1-30) over insulative material 200 (loc.cit.) and a second layer of semiconductive material 204 (col. 9, l. 35-67) physically contacting the first layer of semiconductive material (see Figure 2E and col. 9, l. 35-39), and the second layer of semiconductive material being compositionally different from the first layer of semiconductive material (nickel does exist in 202, and the concentration of nickel, in expression of contrast according to Yamazaki-1, exists hardly in 204: see col. 10, l. 1-5). *Motivation to include the teaching by Yamazaki-1 in the invention by Walker et al derives from the improved device characteristics by virtue of the strongly reduced nickel content of the second semiconductive material layer, which supports the active region of the TFT (col. 10, l. 1-19, especially l. 1-5).**

Although Yamazaki-1 appears to specifically only teach the application of his teaching to silicon semiconductive material for the channel supporting layers, Yamazaki_2 actually teach the application of nickel as a catalyst for crystallization through anneal and the use of laser annealing not only for silicon but equally for silicon-germanium (see "Background of the Invention" for the teaching of the reason why application is extended to silicon-germanium, i.e.,

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increased mobility: col. 1, l. 5-65; and see col. 4, l. 24-28), and hence provides testimony of both the *combinability* and the motivation to include application also to silicon-germanium as the basic material for the semiconductor films.

1. **Claims 72-73, 76, 80 and 81** are rejected under 35 U.S.C. 103(a) as being unpatentable over Walker et al, Yamazaki_1 and Yamzaki_2 as applied to claim 71 above, and further in view of Bulsara et al (US 2003/0030091 A1).

As detailed above, claim 71 is unpatentable over Walker et al in view of Yamazaki-1 and Yamazaki-2. None necessarily teach the further limitations defined by claims 72, 73, 80 or 81.

However, it would have been obvious to include said limitations in view of the teaching as prior art by Bulsara et al that relaxed silicon-germanium including a strained layer 18 formed of silicon ([0036], hence claim 73 is also met and, being a SiGe layer ([0036], claim 76 is also met) (i.e., layer with strained lattice, hence inherently crystalline in addition to being strained) and a relaxed underlying silicon-germanium (hence claim 80 also met) crystalline layer 14 ([0035]) (with from 20 to 90 % germanium, hence claim 81 is met because there necessarily is one % value contained in the claimed range) directly applied on a graded silicon-germanium (SiGe) layer 12 (loc.cit.) (i.e., on top of a crystalline silicon-containing layer (inherently crystalline, because without being crystalline here cannot be a grading of the lattice constant (see [0003]) so as to produce field effect transistors (FETs) with increased channel mobility, hence improved device speed (loc.cit.) Implementation of the teaching for both the NFET and the PFET by

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Walker et al necessarily leads to the claimed device because the source/drain regions in Walker et al extend throughout the entire silicon substrate, being members of a poly bit line 333 (see Figure 10A, and see column 13, lines 20-28).

Motivation to include the teaching by Bulsara et al in the invention by Walker et al derives at least from the resulting improvement in device speed as taught by Bulsara (loc.cit.).

2. **Claims 78 and 79** are rejected under 35 U.S.C. 103(a) as being unpatentable over Walker et al, Yamazaki-1, Yamazaki-2 and Bulsara et al as applied to claim 72 above, and further in view of Hsu et al (6,793,731 B1).

As detailed above, claim 72 is unpatentable over Walker et al in view of Yamazaki-1, Yamazaki-2 and Bulsara et al, none necessarily teaching the further limitation defined by claim 78 or claim 79. However, said limitations would have been obvious over Hsu et al, who teach as prior art polycrystalline SiGe (cols. 1-2), while teaching as improvement thereof single-crystal relaxed SiGe free of defects (abstract and col. 2, l. 65 – col. 5, l. 65). It has been held that mere selection of known materials generally understood to be suitable to make a device, the selection of the particular material being on the basis of suitability for the intended use, would be entirely obvious. In re Leshin 125 USPQ 416.

Response to Arguments

Applicant's arguments filed 12/27/06 have been fully considered but they are not persuasive.

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Specifically, Applicant's argument (page 6) that "substitution of the transistor structure of Yamazaki for one of the transistor structures of Walker et al would render it inoperable for the purpose that Walker describes" because "the transistor structures of Walker are non-volatile (specifically FLASH structures) utilized in a non-volatile memory array", while, in contrast, the transistor structure of Yamazaki is a thin film transistor structure that is not configured as non-volatile memory".

However, this argument fails to persuade because Walker et al themselves teach an EEPROM based on thin film transistors (TFT EEPROM) (see the cited embodiments, 8th-10th, and their claim 9) arranged as flash memory array (including the 8th-10th embodiments including Figure 10 as cited). Certainly, then, thin film transistors themselves are compatible with the invention of Walker et al.

Furthermore, Applicant's argument (page 6, central paragraph) that the combination would render the device by Walker et al "inoperable" is not at all substantiated.

The additional argument of "additional processing" in any traverse should have been compared with the stated advantage (see page 4 of previous office action) of improved device characteristics, which no doubt in themselves are worth money and effort. Applicant does not at all make such comparison.

Applicant's argument, on page 7, based on the questioning of suitability of the "structures" of Yamazaki is neither detailed as to what aspects of said structures are allegedly unsuitable, nor is said argument in any way

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substantiated: thin film transistors in themselves are obviously suitable for the invention by Walker et al, as they are actually included therein.

With regard to arguments questioning motivation on page 7 of Remarks it is stressed that re-crystallization through the use of nickel and the removal or reduction of the content of nickel in the active region of any TFT is advantageous for mobility, which immediately increases device speed. This is a universal advantage for any active region of any TFT.

Arguments, if any, on dependent claims appear to fully rely on those in traverse of the independent claim language.

For the above reasons the rejections made in the previous office action mailed 11/07/06 stand.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JPM
March 17, 2007

Primary Patent Examiner:


Johannes Mondt, Ph.D.
(TC3600, Art Unit: 3663)